

REMARKS

Applicant respectfully requests reconsideration and allowance of all pending claims.

I. Status of the Claims

In this Amendment C, claim 1 has been canceled, while claims 3, 10 and 18 have been amended to correct a minor typographical error therein. Accordingly, claims 3-5, 8-15 and 18-21 remain pending in this application.

II. 35 U.S.C. 103(a) Rejections

Reconsideration is requested of the rejection of claims 3-5, 8-15 and 18-21 under 35 U.S.C. §103 as being obvious in view Fahrenholtz (U.S. Patent No. 3,636,058). Reconsideration is further requested of the rejection of claims 3-5 and 8-15 as being obvious in view of Maseda et al. (*Journal of Forensic Sciences*, 1983).¹

A. The Claimed Subject Matter

The pending claims of the present application are directed to a process for the preparation of cannabinoid aryl sulfonates (claim 3, as well as claims 4-5, 8 and 9 depending therefrom), or a process for the purification of a cannabinoid (claim 10, as well as claims 11-15 depending therefrom, and claim 18, as well as claims 19-21 depending therefrom). In relevant part, each of the claims comprises a step of reacting or esterifying at least one cannabinoid with at least one aryl sulfonyl halide in the presence of **at least one base that is a tertiary alkyl amine**, and in particular a tertiary **lower alkyl** amine having the formula $R_5R_6R_7N$ (where each of R_5 , R_6 and R_7 are lower alkyls of 1 to about 6 carbon atoms), to form a cannabinoid aryl sulfonate.

B. The Cited Art

The details of the process disclosed by Fahrenholtz previously discussed in Applicant's Response to Office Action, filed on September 20, 2007 are respectfully reiterated but, in the interests of brevity, will not be repeated here. However, Applicant again points out that, as noted by the Office (see page 2, forth paragraph), Fahrenholtz makes **no reference** to the use of a tertiary alkyl amine, and in particular a lower alkyl amine, base in their reaction. Rather, he uses pyridine as the base.

Furthermore, Applicant respectfully disagrees with the Office's assertion that the disclosure provided by Fahrenholtz:

meets applicant's process claims with the exception of the use of pyridine instead of a trialkyl amine as the basic **catalyst** in the esterification of the

¹ Given that Cahn has been cited only for the purpose of rejecting claim 1, which has been canceled by this Amendment C, this reference will not be discussed at this time.

cannabinoid. However, the **interchangeability** of these basic substances is well known in the art. (Emphasis added.)

First, Applicant points out that the tertiary alkyl amine used on the claimed processes, as well as the pyridine used in the Fahrenholtz reaction, are **not** catalysts. Rather, these are **reagents** added to the reaction mixture, which are consumed in the reaction and which lead to the formation of related by-products. Furthermore, Applicant submits these **reagents** are **not interchangeable**. Rather, one of ordinary skill in the art would clearly recognize **these are very different types of bases**, which in turn lead to the formation of very different reaction by-products. Specifically, it is to be noted that:

- (1) Pyridine has a pKa of about 5.2, whereas tertiary alkyl amines, and in particular tertiary lower alkyl amines, have a pKa of about 11. These respective pKa values mean that lower tertiary alkyl amines are **significantly more basic** than pyridine. Specifically, tertiary lower alkyl amines are about **one million times more basic** than pyridine.
- (2) The by-products formed using these bases are tertiary lower alkyl amine hydrochlorides or pyridine hydrochloride. These by-products are acidic. Furthermore, the pyridine hydrochloride is **significantly more acidic** than the tertiary lower alkyl amine hydrochlorides, about **one million times more acidic**.
- (3) The presence of the above-noted pyridine hydrochloride in the reaction mixture is undesirable for a number of reasons, including because it is such a strong acid. For example, in the case of tetrahydrocannabinol (THC), the acid results in the conversion of the more desirable delta-9 isomer to the less desirable delta-8 isomer.
- (4) In addition to being much less acidic, the tertiary lower alkyl amine hydrochlorides typically precipitate out of the reaction mixture, making them even less likely to cause unfavorable side-reactions to occur (such as the above-noted conversion of the delta-9-THC to the delta-8-THC isomer).

This view of the Fahrenholtz patent is further supported by the declaration of John R. Duchek, which is being submitted simultaneously with this Amendment C. Mr. Duchek is the sole inventor of the present application. In his declaration, Mr. Duchek states that pyridine and tertiary alkyl amines are **not interchangeable**. Mr. Duchek

further states that, in view of the above-noted differences in the strength of these bases, and/or the strength of the acid by-products resulting therefrom, one of ordinary skill in the art would **not** be motivated to interchange them. In fact, one of ordinary skill in the art would arguable be **taught away** from the use of pyridine, in view of the issues surrounding its strength as a base, and/or the strength of the resulting acid by-product.

The Maseda et al. reference does nothing to address the above-noted failures of Fahrenholtz. Rather, like Fahrenholtz, Maseda et al. also make **no reference** to a reaction involving a tertiary alkyl amine. In fact, they do not use an amine base of any kind in the reaction of interest. Rather, as noted by the Office (see page 3, paragraph 2), the disclosed reaction is carried out in the presence of sodium carbonate (NaCO_3).

C. The Claimed Subject Matter is Not Obvious

As set forth in M.P.E.P. §2143, in order for the Office to establish a *prima facie* case of obviousness, three basic criteria must be met: (1) the prior art references, when combined, must teach each and every element of the claim; (2) there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine or modify the references; and (3) there must be some reasonable expectation of success. Applicant respectfully submits the Office has failed to establish a *prima facie* case of obviousness because each and every element of the claims has not been disclosed or suggested, and/or because motivation is simply not provided to modify the cited references as suggested by the Office.

Applicant submits that Fahrenholtz and Maseda et al., both alone and in combination, fail to disclose or suggest a process that, in relevant part, comprises a step of reacting or esterifying at least one cannabinoid with at least one aryl sulfonyl halide in the presence of **at least one base that is a tertiary alkyl amine**, and in particular a tertiary lower alkyl amine having the formula $\text{R}_5\text{R}_6\text{R}_7\text{N}$ (where each of R_5 , R_6 and R_7 are lower alkyls of 1 to about 6 carbon atoms), to form a cannabinoid aryl sulfonate. Notably, as acknowledged by the Office, both Fahrenholtz and Maseda et al. **fail to disclose** the use of a tertiary lower alkyl amine. In fact, Maseda et al. do not use an amine of any kind as a base in the reaction of interest. Accordingly, given that both of these references are **complete silent** with respect to the use of tertiary lower alkyl amines as a base, Applicant submits these references, both alone and in combination, fail to disclose each and every element of the claims.

Applicant further submits that there is simply **no reason or motivation** for one of ordinary skill in the art to modify the disclosures of Fahrenholtz or Maseda et al. in order to perform the process as recited in any one of claims 3, 10 or 18. This is because **Maseda et al. is completely silent with respect to the use of an amine** of any kind as a base in the reaction of interest. Furthermore, **Fahrenholtz does not suggest the interchangeability, and arguably teaches away from the interchangeability**, of a tertiary lower alkyl amine base and pyridine base. This is because pyridine is a base that is significantly weaker than the tertiary lower alkyl amine bases, and because pyridine results in the formation of a significantly stronger, and thus much more harmful, acid by-product.

In view of the foregoing, Applicants respectfully submit that the Office has failed to meet its burden in establishing a *prima facie* case of obviousness here, because (i) each and every element of the processes of independent claims 3, 10 and 18 has not been disclosed or suggested by Fahrenholtz and/or Maseda et al., and/or (ii) motivation is simply not provided by Fahrenholtz and/or Maseda et al. to modify the disclosures provided therein in order to arrive at the processes of claims 3, 10 or 18 as claimed. Therefore, reconsideration of the rejection of these claims, as well as all claims depending therefrom, is respectfully requested.

CONCLUSION

In view of the foregoing, Applicant respectfully requests favorable reconsideration and allowance of all pending claims.

The Commissioner is hereby authorized to charge Deposit Account 13-1160 for any fees due for the submission of this Amendment C, as well as the Declaration being filed simultaneously herewith.

Respectfully submitted,



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